ELECTRODEPOSITION OF ZnX (X=Se, Te) SEMICONDUCTOR THIN FILMS.

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Over the last few years, the family of wide-bandgap II-VI semiconductors has been widely studied due to their fundamental electronic and optical properties (1). Among them, ZnSe, with a direct bandgap of 2.67 eV at 300 ^{o}K, and ZnTe, with a direct gap of 2.26 eV at 300 ^{o}K, are attractive materials for various optoelectronic devices, such as:

- ZnSe: blue-light emitting diodes and lasers; as a window material in heterojunction solar cells, in the place of CdS.
- ZnTe: green light emitting diodes, electro-optic field detectors, switching devices, and as a top layer over p-CdTe for achieving lower contact resistance in CdS/CdTe photovoltaic heterojunctions.

As reviewed elsewhere (2), electrodeposition is a simple and versatile method for preparing thin films of these materials. In this work results on the preparation and characterization of ZnSe and ZnTe thin films obtained by electrodeposition are presented.

Voltammetric curves were recorded in order to characterize the electrochemical behavior of the Zn^{+2} / SeO_2 and Zn^{+2} / $HTeO_2^{+}$ systems on different substrates.

Thin films were deposited potentiostatically from an unstirred, deareated aqueous solutions onto titanium, glass substrates coated with fluorine doped tin oxide and ITO glass substrates. ZnSe thin films have been grown from solutions containing 0.2 M $ZnSO_4$ and 10^{-4}-10^{-3} M SeO_2, (pH=2.4), at 60 ^{o}C. On the other hand, ZnTe films have been electrodeposited from a 0.5 M $ZnSO_4$, 10^{-4} M $HTeO_2^{+}$ (pH=4.37) solution, held at 95-96 ^{o}C.

The effect of main parameters such as the deposition potential, chalcogen precursor concentration and annealing on film composition and structure were analyzed.

The as-grown and treated layers were characterized by X-ray energy dispersive analysis, X-ray diffraction, scanning electron microscopy and photoelectrochemical studies.

X-ray diffraction shows that the cubic ZnSe and the cubic ZnTe phases have been formed as-grown.

Optical measurements were done on these samples. From the optical reflectance spectra, the bandgaps of the samples grown onto titanium were found. For ZnSe we obtained a bandgap of 2.64 eV, and for ZnTe we obtained a value of 2.25 eV. These values are quite close to the accepted room temperature bandgaps: 2.67 and 2.26 eV, respectively.

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